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Personal Views — Report from Ground Zero*

Two days after the attacks on the World Trade Center, Alan Vette and Matthew Landis found themselves preparing to depart for lower Manhattan with a mobile laboratory and the toughest assignment of their careers.

It wasn't until they were in a truck driving north to Manhattan on September 15 that they grasped the enormity of the task that lay before them. They had no idea what they might encounter but tried to mentally prepare themselves. When Drs. Vette and Landis, research scientists with the EPA's National Exposure Research Laboratory, reached Ground Zero, they were not so much shocked as numbed. Vette remembers, "I had never seen war up close and personal, but that's got to be what it looks like."

The two spent the next 13 days in lower Manhattan. Working without access to electrical power, encumbered by respirators, and surrounded by police officers and members of the National Guard and Coast Guard, they set up four air-quality monitoring stations designed to identify pollutants and assess the long-term health impact of the collapse of the Twin Towers. While the EPA's Region 2 office coordinated the day-to-day environmental clean-up efforts and oversaw communications with both the public and the media, Vette and Landis focused on the longer-range consequences of the attacks. Questions like: what kinds of chemicals were in dust samples collected upwind and downwind from Ground Zero; whether the concentration of certain airborne elements changed during heavy demolition or excavation activities; how did the fires affect the air quality; and how safe was the air at Fresh Kills landfill on Staten Island where officials were sifting through millions of tons of debris?

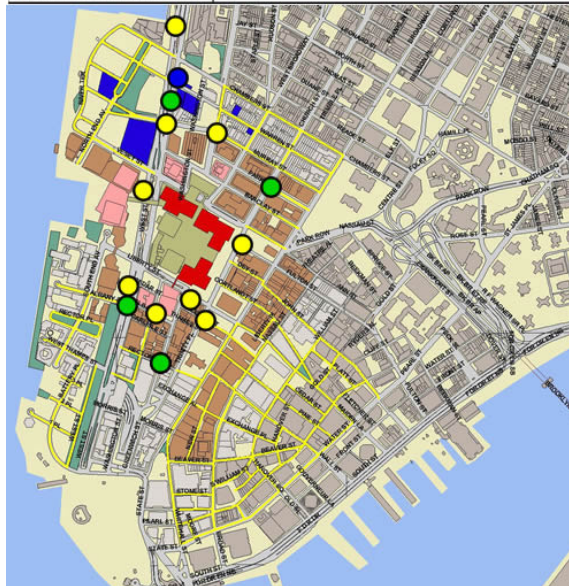
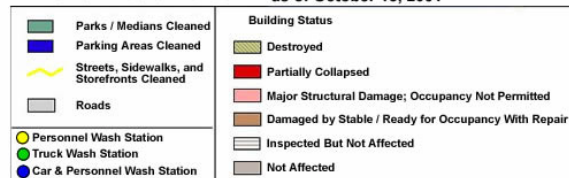
For Landis, the visit to Fresh Kills was the moment when it all hit him. "We were working alongside the folks who were sorting through

the debris, and you could see things like teddy bears and people's shoes, their personal effects, ID cards, briefcases, and purses — all of that stuff belonged to somebody."

Each day, Landis and Vette ran a virtual gauntlet inside the Holland Tunnel in order to get to Ground Zero. Closed to all but rescue and other federally authorized workers, the tunnel had four separate checkpoints. The last of these was a set of large trucks, which were moved to let workers like Landis and Vette pass. In downtown Manhattan, they then had to clear both an external security zone and an inner loop where security was even tighter.

Inside Ground Zero, the two teamed to set up and service a monitoring network that yields continuous measurements and daily integrated samples of fine-fraction particulate matter

World Trade Center Cleaned Areas and Wash Stations as of October 15, 2001



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(<2.5µm), and gaseous volatile organic compounds. Except for some elevated levels of lead early in the process — levels that soon dropped — Landis and Vette found nothing terribly remarkable. The elemental composition of the dust was fairly consistent with building materials. It should be noted that other researchers in academia had found elevated levels of polycyclic aromatic hydrocarbons in the dust.

Today the two researchers continue to analyze data collected as part of EPA's monitoring efforts, which were completed on May 15, 2002. Their findings will be published in peer-reviewed journals. Although most of the monitoring was conducted to identify immediate health concerns, Landis and Vette are interested in a detailed characterization of the pollution and the implications for long-term health risks. Future disaster-relief efforts stand to benefit from their findings. Their research may shed light, for example, on the relative importance of extinguishing fires early in an emergency clean-up operation, or on restricting demolition and debris removal in order to limit emissions.

Both Vette and Landis say their academic careers — each obtained his Ph.D. in 1998 from the University of Michigan School of Public Health — gave them crucial knowledge and skills for this type of work. As graduate students, both took part in several intensive air-monitoring campaigns with Professor Gerald Keeler at sites in Chicago, Detroit, Florida, and Baltimore before beginning their research at the EPA. "The only difference was [then] we had the benefit of being able to plan," says Vette. "In this case, we didn't have much time to plan up front how we were going to carry out the study in New York, so we had to draw on those experiences from the past. Knowing what we did and learning what we did in graduate school certainly helped us do that."

Understandably the experience has prompted both men to reevaluate the significance of their chosen profession. "We both work in various ways to protect the public's health, and this is certainly one way," Vette notes. "I never thought this type of situation would arise — I don't think anyone did. But it has made me think about future things that could be done to protect people's health."

To peers, colleagues and current students, Landis offers this encouragement: "A lot of times public health work is not in the news, and you may not get a lot of attention for what you do, but it sure is important. It's just like the military," he adds. "You take it for granted until you need it. I

just hope we can respond as well in other events."

*NOTE: the article was originally published in the University of Michigan School of Public Health magazine *Findings*. This is the first in a series of reports from EPA staff involved in activities at the World Trade Center.

Anthrax Response

During December and January, Jim Kitchens, from NERL's Ecosystems Research Division, assisted EPA Region 3 safety personnel in the Anthrax clean-up of the Senate office buildings and postal facility in the Washington, DC area. While at the site, he participated in surveys of activities including the chlorine dioxide decontamination of the Hart Senate Office Building and recovery of spore strips from ethylene oxide sterilization of office materials, review of newly constructed decontamination areas at the P Street postal facility, and oversight of the health and safety activities involved at the affected sites.

While at the Anthrax response, he was asked to assist with an emergency response at the U.S. Department of Commerce. Mail that had been irradiated and sealed in shrink-wrap was opened in the Commerce Building resulting in illness to eleven people and hospitalization of three. Kitchens provided chemical expertise for the EPA Region 3 response, consulting with Department of Commerce, FBI, DC Fire, and Capital Police.



Commander Brian Kovak (left) and Jim Kitchens (right) inside the Capital Police Station, which was used as the command post for the Anthrax response.

Identifying the Hepatitis E Virus in Water

A new method developed to identify the waterborne hepatitis E virus (HEV) was described in a recent journal article by Ann Grimm and G. Shay Fout, "Develop-

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ment of a Molecular Method to Identify Hepatitis E Virus in Water,” which was published in the March, 2002, issue of the

Journal of Virological Methods. HEV is one of the most common causes of hepatitis worldwide. In most cases the illness caused by this virus is symptomatically similar to hepatitis A, but it is particularly severe in pregnant women, causing a 15–25% maternal fatality rate. To date, there have been no recorded outbreaks of HEV in humans in the U.S.; however, sporadic cases have been seen, usually among travelers who have visited endemic countries.

There has been a recent report of a person in the U.S. infected with a version of HEV that is 97% identical to a type of HEV found in hogs — this person had not traveled outside of the U.S. Swine HEV is endemic in the Midwest, so it is possible that swine or other animals may act as reservoirs for this virus. Similar cases of humans infected with swine-like HEV have been reported in Taiwan.

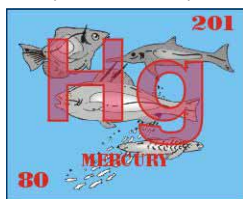
Due to the potential for an HEV outbreak in the U.S., a rapid method to detect both human and swine HEV in water has been developed and will be used to look for HEV in environmental water samples.

Ann Grimm, NERL-Cincinnati, (513) 569-7397

**NERL Task #5423*

Mercury Measurements and Analysis

Scientists at the NERL's Environmental Sciences Division (ESD) are using several approaches to measure and analyze mercury levels.



Results of recent research were presented at the national meeting of the Society of Environmental Toxicology and Chemistry (SETAC) by Dr. James Cizdziel, a National Research Council postdoctoral associate at

ESD. The approach uses a commercially available instrument that directly analyzes liquid or solid samples without digestion. This analysis method is much faster than conventional methods of measuring mercury, requires less sample, and produces virtually no laboratory waste. It has been validated for both whole-fish and fish muscle tissue by Thomas Hinnners of ESD (manuscript in preparation).

Dr. Cizdziel combined the analytical method with micro-sampling of muscle tissue with a biopsy punch. Dr.

Cizdziel, mentored by Dr. Ed Heithmar of ESD, demonstrated that concentrations representative of the entire fish muscle can be obtained from milligram-size samples, making possible non-lethal mercury sampling, as well as measurements on samples intended for other analyses. He applied the method to fish collected from Lake Mead by researchers led by Dr. James Pollard of the University of Nevada, Las Vegas. As expected, mercury concentrations were higher in fish of higher trophic level and larger size. Mercury concentrations were found to be highly correlated between muscle, liver, and blood tissues, with evidence of redistribution toward the liver at high concentration. Dr. Cizdziel also provided a summary of his results to the Lake Mead Water Quality Forum (a consortium of federal, state, and local agencies).

An article published in the Native American Fish and Wildlife Society newsletter, *From the Eagle's Nest*, describes a similar effort that is being undertaken by NERL. According to the article, “Use of ... a mercury analyzer has been proposed by EPA research chemist Thomas A. Hinnners for a study of the Aleut community on St. Paul Island in the Arctic. In an outreach effort with Mr. Michael Schaver, Environmental Coordinator with the Big Valley Rancheria, Lakeport, CA, (the Big Valley Band of Pomo Indians), this type of analyzer may be acquired by the Tribe to assess mercury exposures in a tribal area of California.” The article also states, “Mercury levels in fish tissue are relevant to the health not only of humans, but also of fish-eating mammals and birds.” The mercury analyzer can be used to detect levels of mercury in hair, fish-tissue, and feathers.

Edward Heithmar, NERL-Las Vegas, (702) 798-2626

Thomas Hinnners, NERL-Las Vegas, (702) 798-2140

**NERL Task #5452*

Developing Landscape Indicator Models

Nearly 1 billion pounds of pesticides are used annually in the United States, with approximately 80 percent being used for agricultural purposes and the remainder used for industrial, commercial, and household purposes. Excess pesticides and nutrients may be transported to streams through ground-water discharge or overland runoff and can cause a variety of ecological and human-health effects.

A variety of interacting natural and human processes affect the level of pesticides and nutrients in streams and ground water. Landscape-indicator models can be used to identify specific areas of concern and target

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the limited resources typically available for environmental monitoring, mitigation, or remediation.

The NERL Environmental Sciences Division is collaborating with the U.S. Geological Survey to relate land use, geology, and other geographic variables to water quality and aquatic ecology in approximately 200 small streams of the Mid-Atlantic Coastal Plain. Data from the study, which includes coastal areas from New Jersey to North Carolina, will be used to develop landscape-indicator models of pesticides and nutrients and to provide an assessment of water quality and stream biology in the study area.

*Ann Pitchford, NERL-Las Vegas, (702) 798-2366
NERL Task #5448



Water Safety

The NERL Ecological Exposure Research Division has two important documents now available to assist anyone in working safely on rivers and selecting sampling methods. Both of these documents are available on a web site.

- Comparisons of Boating and Wading Methods Used to Assess the Status of Flowing Waters: by J. E. Flotemersch, S. M. Cormier and B. C. Autrey (SoBran Inc.) EPA600/R-00/108 (www.epa.gov/EERD/MCD_nocover.pdf).
- Logistics of Ecological Sampling on Large Rivers: by J. E. Flotemersch, S. M. Cormier and B. C. Autrey (SoBran Inc.) EPA600/R-00/109 (www.epa.gov/EERD/logistics_nocover.pdf).

In addition to these products, statistical comparison of biological and physical habitat data collected at 60 boatable river sites using a variety of methods is underway. The biological side of the study includes the comparison of various field methods for the collection of fish, benthic macroinvertebrates, and algae.

The field component of an additional large river benthic macroinvertebrate project studying the relationship of distance sampled with metrics and species composition, as well as variability among transects and between banks was completed this summer. These data will be analyzed to determine the most efficient sampling design for large rivers.

*Susan Cormier, NERL-Cincinnati, (513) 569-7995
NERL Task #8374

Serving Organic Compounds on ICE

Ion Composition Elucidation (ICE) is a very selective and sensitive analytical technique developed by the NERL Environmental Sciences Division for characterizing or identifying compounds such as pharmaceuticals and personal care products found at trace levels in water and other environmental samples. ICE relies on the high resolving power of a double-focusing mass spectrometer. Currently, this analytical approach can only be performed by the NERL, but Dr. Andy Grange is in the process of transferring this technology to the Centers for Disease Control for use in solving complex analytical problems. NERL is also applying this technology to complex environmental problems in coordination with Professor David Epel of Stanford University, Professor Lawrence R. Curtis of Oregon State University, and Mr. Floyd Genicola of the New Jersey EPA.

*Andy Grange, NERL-Las Vegas, (702) 798-2137
NERL Task #5452

Volatile Organic Compounds

An article published in the April–May 2002 issue of *The Solution* (a GSA newsletter) highlighted three areas of research by the NERL Environmental Sciences Division (ESD): soil and sediment sampling methods, ground-water sampling and geophysical methods development and evaluation, and the environmental technology verification (ETV) program.

All three areas of research focus on volatile organic compounds (VOCs) in the environment. The ESD works to improve the accuracy, efficiency, and representativeness of sampling techniques for collecting soils and sediments contaminated with VOCs. This work includes research into ground-water sampling methods and geophysical methods development for detecting and monitoring contaminants within and below ground-water and in the soil/vadose zone (located in the zone of aeration above the ground water level). The ETV program is used to test and verify the performance of instruments and tools.

The GSA newsletter underscores the importance of this research by stating, “VOCs are the most common contaminants encountered at Superfund and other hazardous waste sites. Many VOCs are considered hazardous because they are toxic, mutagenic, and carcinogenic, and because they are highly mobile in the subsurface.”

Scientists at the ESD are making valuable contributions toward developing methods for measuring VOC concentrations and understanding how they behave in the envi-

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ronment, with the ultimate goal of establishing standard protocols. Furthermore, the ETV program seeks to provide decision makers with objective, quality-assured data on commercial-ready environmental technologies.

Eric Kogin, NERL-Las Vegas, (702) 798-2432

**NERL Task #5539*



Regional Vulnerability Assessment (ReVA)

NERL is the leading partner in the ORD-wide Regional Vulnerability Assessment (ReVA) program, which is an approach to regional scale, priority-setting assessment. ReVA is a cooperative effort among laboratories and centers across ORD that is integrating research on human and environmental health, ecorestoration, landscape analysis, regional exposure and modeling, problem formulation, and ecological risk guidelines. The following articles highlight recent or upcoming ReVA activities.

Elizabeth R. Smith, NERL-RTP, (919) 541-0620

**NERL Task #8877*

ReVA/MAIA CONFERENCE IN 2003—The first Regional Vulnerability Assessment (ReVA) conference will be May 13–15, 2003 in Valley Forge, Pennsylvania. Planning is underway and a call for papers will be out soon. The conference will focus on work that has been done for the ReVA pilot study in the mid-Atlantic region as part of the Mid-Atlantic Integrated Assessment (MAIA) and will also look ahead to research that is planned as ReVA expands to include additional endpoints (e.g. estuarine health) in that region and gears up for a second region. The call-for-papers will solicit presentations on research that is relevant to ReVA, both in the Mid-Atlantic and in other regions. There will also be training sessions on decision-support tools developed with support from ReVA. More information will be coming to you soon.

ReVA's WEB-BASED APPLICATION—The Regional Vulnerability Assessment (ReVA) is developing a number of decision-support applications but is focusing initial efforts on a web-based application developed by Waratah Corpora-

tion to serve as the analysis engine for upcoming results and for the decision workshops. Written in S-Plus, the application allows exploration of data for hypothesis generation and preliminary analyses. It provides multiple ways to view the presentation of individual indicators/coverages or integrated results using a subset of the data or the entire data set. It will also allow analyses on areas smaller than the entire region, e.g. the mid-Atlantic Highlands. It will soon have all of the candidate integration methods and will incorporate a number of future scenarios based on client-determined management options. The application will soon allow differential weighting of indicators/data along with comparison of results so that trade-offs can be evaluated.

Application demonstrations have received strong endorsement from potential users, including EPA regional offices. The application provides flexibility for data, i.e. the same framework can be taken to other regions (the ReVA team is already talking with Regions 4 and 5 about developing versions that use data that represent those regions), and can be adapted to any scale, i.e. national or subregional. It is hoped that the application can be deployed on an EPA public server in early FY 03, following review of data and integration methods and results.

INTEGRATING HUMAN AND FISCAL HEALTH INTO ReVA—The Regional Vulnerability Assessment (ReVA) is moving beyond just doing an ecological assessment towards a comprehensive environmental assessment — one that not only considers information on risks to human health, but also considers how the financial health of families and communities and changes in quality of life can impact environmental quality (e.g., the impact of the opening or closing of a major center of employment). ReVA has identified a number of data sets, primarily from census data, that will help to identify where there are sensitive subpopulations of people — areas where there are lots of old or young people, or those that don't have ready access to regular health care. Similarly, ReVA is also including data on employment, indicators of fiscal health, and projected changes in demographics to reveal areas that may be more sensitive to changes in environmental quality. While the initial analyses of these endpoints will be very coarse, they will be included in the first assessments and should provide a much clearer picture of how changes in environmental condition affect our quality of life.

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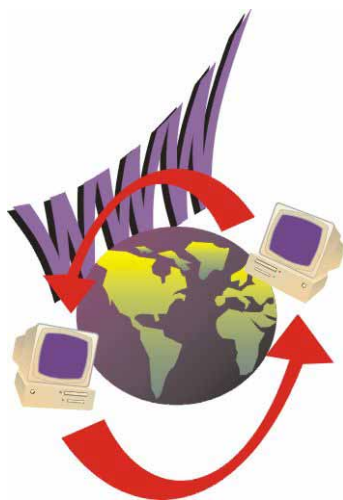
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ESTABLISHING LINKS WITH THE PLANNING COMMUNITY—

Everyone on the Regional Vulnerability Assessment (ReVA) team is particularly interested in applying their research results and informing environmental decisions. Much of the research they have done considers land use change and how that affects water quality, habitat, and quality of life. Because of this, they have initiated discussions with the American Planning Association (APA) to work together to get their research results into the hands of planners across the country. Working with the APA's research department, the ReVA team hopes to develop better ways to communicate the research results such that they go beyond the usual science community to the people making land use decisions.



Check Out These Web Sites

- <http://www.epa.gov/nerlesd1/cmb/default.htm>

Characterization and Monitoring — This group's research and technical support address questions about monitoring for site characterization, pollution prevention, the detection and assessment of contaminants, and decision support systems for site characterization and the evaluation of exposure.

- <http://www.epa.gov/nerlesd1/chemistry/ice/default.htm>

Ion Composition Elucidation (ICE) — This site provides access to information about ICE and its applications.

- <http://www.epa.gov/nerlesd1/chemistry/vacuum/default.htm>

Vacuum Distillation — This site provides information about vacuum distillation as a means to extract volatile chemicals from most media.

- <http://www.epa.gov/nerlesd1/land-sci/srsv/default.htm>

Spectral Remote Sensing of Vegetation Conference — This conference is to be held at the NERL's Environmental Sciences Division in Las Vegas, Nevada, on December 3–5, 2002. It will focus on applying to vegetation research spectral information obtained from passive and active sensors using imaging and non-imaging remote sensing systems. Both lab-based and field-based (including airborne or spaceborne) studies are invited.

- <http://www.epa.gov/nerlesd1/land-sci/ny.htm>

New York City Watershed Assessment — This site provides information from an assessment of the Catskill/Delaware watersheds, which supply 90% of New York City's drinking water (the report is undergoing peer review).

- <http://www.consecol.org/Journal/vol4/iss2/art3/index.html> [Exit EPA ➡](#)

The US Forest Service, in collaboration with the Landscape Sciences Program, completed a global assessment of forest fragmentation using 1-km AVHRR data from the USGS EROS Data Center. The assessment, which highlights a new fragmentation metric developed by Dr. Kurt Riitters, Deputy Director for the US Forest Service's National Forest Health Monitoring Program, was published in *Conservation Ecology*, an on-line journal of the Ecological Society of America.

Please send your comments, feedback, or items for inclusion in the next edition to:
Robin Baily (baily.robin@epa.gov)